What is claimed is:

1. A noise adaptation system of speech model for adapting a speech model for any noise to speech to be recognized in a noisy environment, said speech model being learned by using clean speech data, said system comprising:

clustering means for clustering noise-added speech;

speech model space generating means for generating a tree-structure noisy speech model space based on the result of the clustering performed by said clustering means;

parameter extracting means for extracting a speech feature parameter of input noisy speech to be recognized;

selecting means for selecting an optimum model from the tree-structure noisy speech model space generated by said speech model space generating means; and

linear transformation means for applying linear transformation to the model selected by the selecting means so that the model provides a further increased likelihood.

2. The noise adaptation system of speech model according to claim 1, wherein said clustering means generates said noise-added speech by adding said noise to said speech in accordance with a signal-to-noise ratio condition, subtracts the mean value of speech cepstral of the generated noise-added speech, generates a Gaussian distribution model of each of pieces of generated noise-added speech, and calculates the

likelihood between the pieces of noise-added speech to generate a likelihood matrix to provide a clustering result.

3. The noise adaptation system according to claim 1 or 2, wherein said selecting means selects a model that provides the highest likelihood for the speech feature parameter extracted by said parameter extracting means.

4. The noise adaptation system according to claim 3, wherein said selecting means selects a model by searching said tree-structure noisy model space downward from the highest to the lowest level.

5. The noise adaptation system according to one of claims 1 to 4, wherein said linear transformation means performs the linear transformation on the basis of the model selected by said selecting means to increase the likelihood.

6. A speech model noise adaptation method for adapting a speech model for any noise to speech to be recognized in a noisy environment, said speech model being learned by using clean speech data, said method comprising:

a clustering step of clustering noise-added speech;

a speech model space generating step of generating a tree-structure noisy speech model space based on the result of the clustering performed at said clustering step;

a parameter extracting step of extracting a speech feature parameter of input noisy speech to be recognized;

a selecting step of selecting an optimum model from the tree-structure noisy speech model space generated at said speech model space generating step; and

a linear transformation step of applying linear transformation to the model selected at the selecting step so that the model provides a further increased likelihood.

7. A noise adaptation program for speech recognition that controls a computer to adapt a speech model for any noise to speech to be recognized in a noisy environment, said speech model being learned by using clean speech data, said program comprising:

a clustering step of clustering noise-added speech;

a speech model space generating step of generating a tree-structure noisy speech model space based on the result of the clustering performed at said clustering step;

a parameter extracting step of extracting a speech feature parameter of input noisy speech to be recognized;

a selecting step of selecting an optimum model from the tree-structure noisy speech model space generated at said speech model space generating step; and

a linear transformation step of applying linear transformation to the model selected at the selecting step so that the model provides a further increased likelihood.